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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/698,222	10/31/2003	Jianou Shi	5589-06800 P1270	1492

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DAFFER MCDANEIL LLP
P.O. BOX 684908
AUSTIN, TX 78768

EXAMINER	
LE, TOAN M	

ART UNIT	PAPER NUMBER
2863	

DATE MAILED: 04/05/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/698,222	SHI ET AL.	
	Examiner	Art Unit	
	Toan M. Le	2863	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *31 October 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-11,15,20,21,23 and 25* is/are rejected.

7)☒ Claim(s) *4,12-14,16-19,22 and 24* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 October 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *3/18/04, 3/22/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

Please label the blocks in figures 1 and 3-6.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 5-11, 20-21, 23, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by "Contactless Surface Charge Semiconductor Characterization", Schroder (referred hereafter Schroder).

Referring to claim 1, Schroder discloses a non-contact method for determining a parameter of an insulating film formed on a substrate (Abstract), comprising:

measuring at least two surface voltages of the insulating film, wherein the surface voltages are measured after different charge depositions on the insulating film, and wherein said measuring is performed in two or more sequences (page 204, 2nd col., 1st paragraph);

determining individual parameters for the two or more sequences from the at least two surface voltages and the different charge depositions (page 204, 2nd col., 1st paragraph, equations 18-22); and

determining the parameter of the insulating film as an average of the individual parameters (page 205, 2nd col., 1st paragraph, figure 16).

As to claim 2, Schroder discloses a non-contact method for determining a parameter of an insulating film formed on a substrate (Abstract), wherein the average is a weighted average (page 205, 2nd col., 1st paragraph, figure 16).

Referring to claim 3, Schroder discloses a non-contact method for determining a parameter of an insulating film formed on a substrate (Abstract), wherein the insulating film is a leaky insulating film (page 206, 2nd col., section 5.6, equations 23-24).

As to claim 5, Schroder discloses a non-contact method for determining a parameter of an insulating film formed on a substrate (Abstract), wherein a first of the two or more sequences is a reverse of a second of the two or more sequences (page 205, 2nd col., 2nd paragraph, figure 17).

Referring to claim 6, Schroder discloses a non-contact method for determining a parameter of an insulating film formed on a substrate (Abstract), wherein the parameter is equivalent oxide thickness (page 205, section 5.5, equations 18-22).

As to claim 7, Schroder discloses a non-contact method for determining a parameter of an insulating film formed on a substrate (Abstract), wherein the parameter is substantially independent of leakage in the insulating film (page 206, 2nd col., section 5.6, equations 20 and 23).

Referring to claim 8, Schroder discloses a non-contact method for determining a parameter of an insulating film formed on a substrate (Abstract), wherein a time delay between the different charge depositions and said measuring is kept at a minimum such that the at least two surface voltages do not decrease substantially between the different charge depositions and said measuring due to leakage in the insulating film (page 204, 2nd col., 1st paragraph; page 206, 2nd col., section 5.6).

As to claim 9, Schroder discloses a non-contact method for determining a parameter of an insulating film formed on a substrate (Abstract), wherein said measuring is performed in a minimum amount of time such that the at least two surface voltages do not decrease substantially during said measuring due to leakage in the insulating film (page 204, 2nd col., 1st paragraph; page 206, 2nd col., section 5.6).

Referring to claim 10, Schroder discloses a non-contact method for determining a parameter of an insulating film formed on a substrate (Abstract), wherein the different charge depositions comprise depositing a charge on the insulating film, and wherein the charge comprises a positive charge, a negative charge, or some combination of a positive and a negative charge (page 204, 2nd col., 1st paragraph).

As to claim 11, Schroder discloses a non-contact method for determining a parameter of an insulating film formed on a substrate (Abstract), wherein the different charge depositions are substantially uniform across an area on which the different charge depositions are performed (page 204, 2nd col., 1st paragraph).

Referring to claim 20, Schroder discloses a computer-implemented method, comprising determining a characteristic of an insulating film (Abstract) using two parameters of the insulating film selected from the group consisting of equivalent oxide thickness (page 205, section 5.5), optical thickness (page 203, 2nd col., 1st and 2nd paragraphs), and a measure of leakage through the insulating film (page 206, 2nd col., section 5.6), wherein the characteristic comprises a dose of a component in the insulating film, a percentage of the component in the insulating film, or a presence of the component in the insulating film (page 198, 1st col., last paragraph; page 209, 1st col., Summary section).

As to claim 21, Schroder discloses a computer-implemented method, comprising determining at least one composition parameter (page 198, 1st col., last paragraph) and physical thickness of an insulating film (page 205, section 5.5) using a model (Surface Voltage (SV) or Surface Photovoltage (SPV), Introduction on page 196) and two or more parameters of the insulating film as input to the model, wherein the two or more parameters are functions of the at least one composition parameter or the physical thickness (equations 18-22), and wherein at least one of the two or more parameters is from a non-contact electrical measurement (Abstract).

Referring to claim 23, Schroder discloses a computer-implement method, wherein the two or more parameters comprise equivalent oxide thickness, optical thickness, a thickness measurement from tunneling electron microscopy, X-ray photoelectron spectroscopy, scanning capacitance microscopy, scanning force microscopy, energy dispersive X-ray spectroscopy, electron stimulated X-ray, X-ray diffraction, or X-ray reflectance, data from charge vs. voltage, current vs. voltage, or capacitance vs. voltage measurements, or information about a process used to form the insulating film (figures 1-21; page 209, Summary section).

As to claim 25, Schroder discloses a computer-implement method, further comprising monitoring or controlling at least one parameter of a process tool using the at least one composition parameter or the physical thickness (page 197, 2nd col., 2nd paragraph).

Claims 4, 12-14, 22, and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The reason for allowance of the claim 4 is the inclusion of a nitridated insulating film.

The reason for allowance of the claim 12 is the inclusion of the steps of measuring an optical thickness of the insulating film and determining a nitrogen dose, nitrogen percentage, and a presence of nitrogen in the insulating film using the equivalent oxide thickness and the optical thickness.

The reason for allowance of the claim 13 is the inclusion of the step of determining a nitrogen dose, nitrogen percentage, and a presence of nitrogen in the insulating film using the equivalent oxide thickness and a measure of leakage through the insulating film.

The reason for allowance of the claim 14 is the inclusion of using a feedback control technique and a feedforward control technique in a process tool responsive to the parameter of the insulating film.

The reason for allowance of the claims 22 and 24 is the inclusion of characterizing nitrogen dose, nitrogen percentage in the insulating film using decoupled plasma nitridation.

Claims 15 is rejected under 35 U.S.C. 102(b) as being anticipated by "Corona-Oxide-Semiconductor Device Characterization", Schroder et al. (referred hereafter Schroder et al.).

Referring to claim 15, Schroder et al. disclose a computer-implemented method, comprising determining a characteristic of nitrogen in an insulating film using two parameters of the insulating film selected from the group consisting of equivalent oxide thickness, optical thickness, and a measure of leakage through the insulating film, wherein the characteristic comprises a nitrogen dose, a nitrogen percentage, or a presence of nitrogen in the insulating film (Abstract; page 508, 1st col., section 2.1.3, 1st, 2nd, and 3rd paragraphs; page 509, 2nd col., last paragraph).

Claims 16-19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The reason for allowance of the claims 16-19 is the inclusion of insulating film which is a leaky film substantially independent of the equivalent oxide thickness formed on a wafer and the step of using a feedback control technique and a feedforward control technique of a process tool in response to the characteristic of nitrogen in an insulating film formed on the wafer by decoupled plasma nitridation.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Toan M. Le whose telephone number is (571) 272-2276. The examiner can normally be reached on Monday through Friday from 9:00 A.M. to 5:30 P.M..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on (571) 272-2269. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Toan Le

March 24, 2005

John Barlow
Supervisory Patent Examiner
Technology Center 2800

Attachment for PTO-948 (Rev. 03/01, or earlier)
6/18/01

The below text replaces the pre-printed text under the heading, "Information on How to Effect Drawing Changes," on the back of the PTO-948 (Rev. 03/01, or earlier) form.

INFORMATION ON HOW TO EFFECT DRAWING CHANGES

1. Correction of Informalities -- 37 CFR 1.85

New corrected drawings must be filed with the changes incorporated therein. Identifying indicia, if provided, should include the title of the invention, inventor's name, and application number, or docket number (if any) if an application number has not been assigned to the application. If this information is provided, it must be placed on the front of each sheet and centered within the top margin. If corrected drawings are required in a Notice of Allowability (PTOL-37), the new drawings **MUST** be filed within the **THREE MONTH** shortened statutory period set for reply in the Notice of Allowability. Extensions of time may NOT be obtained under the provisions of 37 CFR 1.136(a) or (b) for filing the corrected drawings after the mailing of a Notice of Allowability. The drawings should be filed as a separate paper with a transmittal letter addressed to the Official Draftsperson.

2. Corrections other than Informalities Noted by Draftsperson on form PTO-948.

All changes to the drawings, other than informalities noted by the Draftsperson, **MUST** be made in the same manner as above except that, normally, a highlighted (preferably red ink) sketch of the changes to be incorporated into the new drawings **MUST** be approved by the examiner before the application will be allowed. No changes will be permitted to be made, other than correction of informalities, unless the examiner has approved the proposed changes.

Timing of Corrections

Applicant is required to submit the drawing corrections within the time period set in the attached Office communication. See 37 CFR 1.85(a).

Failure to take corrective action within the set period will result in **ABANDONMENT** of the application.

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